electromagnets S_1 to S_4 that are shown in FIG. **5**. The letter t and the associated arrow indicate the time and its direction. The horizontal lines delineate the start and cut-off of the pulses by the switch S shown in FIG. **6**. By example, **19** is defined as a positive pulse, **20** as a negative one. The sequence of pulses that is shown rotates the permanent magnet in the prosthesis in four steps of 90 degrees through a complete revolution. Each step of 90 degrees requires two sets of pulses (as will be clear from FIG. **8**). Depending on the desired amount of expansion of the prosthesis, the sequence of pulses can be either shorter than shown, or can be repeated wholly or in part.

FIG. **8** is a schematic hysteresis diagram for a permanent magnet in the prosthesis. The abscissa H_0 is the magnetic field strength produced by the external magnetic apparatus at the center of the permanent magnet. The ordinate M_{pm} is the (variable) magnetization of the permanent magnet. A set, at a given time, of the four current pulses to the four electromagnets will move a point in the diagram from A (at the beginning of the set of pulses) to B to C (at the end of the set of pulses). The next set of pulses will move the point from C to D and back to A. These pairs of sets of pulses can be repeated as is required by the desired amount of expansion of the prosthesis.

While particular forms of the invention have been illustrated and described, it will be apparent that various modifications can be made to the present invention without departing from the spirit and scope thereof.

I claim as my invention:

1. A prosthesis, in the form of a rod with a length much greater than its diameter, that is surgically implanted and can be expanded in length without new surgery,

in combination with a magnetic apparatus that is external to the patient's body and generates a magnetic field that interacts with the magnet in the said prosthesis comprising:

a magnet in the said prosthesis;

a mechanism that transforms the motion of the said magnet in the prosthesis, relative to other parts of the said prothesis, into an expansion of the length of the said prosthesis;

means to rotate the magnetic field that is generated by the said magnetic apparatus relative to the patient's body.

2. The combination defined in claim 1 wherein the said mechanism comprises at least one pair of mutually meshing male and female threads and wherein the said motion of the said magnet in the prosthesis is a rotation relative to other parts of the said prosthesis and causes an expansion of the said prosthesis.
3. The combination defined in claim 1 wherein the said magnet in the said prosthesis is a permanent magnet.
4. The combination defined in claim 1 wherein the said magnet in the said prosthesis is an electromagnet.
5. The combination defined in claim 1 wherein there is in the said prosthesis a ratchet mechanism that allows an expansion of the length of the said prosthesis, but prevents a reduction of the length.
6. The combination defined in claim 1 wherein the said magnetic apparatus is

supported by rollers or by bearings that allow the rotation of the said magnetic apparatus around the patient's limb that contains the prosthesis.

7. The combination defined in claim **1** wherein the magnetic field of the said magnetic apparatus is produced by at least one electromagnet.
8. The combination defined in claim **1** wherein the magnetic field of the said magnetic apparatus is produced by at least one permanent magnet.
9. The combination defined in claim **7** wherein the electric power to the said electromagnets is supplied via slip rings and electric brushes from a stationary power supply.
10. The combination defined in claim **5** wherein the said ratchet mechanism contains an elastomer with flexible prongs that engage the teeth on the shaft of the said ratchet mechanism.
11. A magnetic apparatus external to a patient's limb and comprising at least four electromagnets, in combination with prostheses that use an internal magnet, the said magnetic apparatus generating magnetic fields interacting with the magnet in the prosthesis by means of current pulses that are short compared to the pauses between them.
12. The combination defined in claim **11** wherein the said current pulses are generated by discharges of capacitors.
13. The combination defined in claim **11** wherein electric switches control the length and timing of the said current pulses and, when needed, reverse the current direction in the said current pulses.
14. The combination defined in claim **1** wherein the said magnetic apparatus

comprises at least one magnetic field sensor and readout for the observation by the physician of the position of the said magnet in the said prosthesis, obviating the need for multiple x-ray examinations.

15. The combination defined in claim **1** wherein a sling is provided that is exerting a controlled stretching force to the patient's limb that has the said prosthesis.

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